

## **CHAPTER 8**

### **FUNCTIONALITY AND VENDOR SELECTION**

**STEPHEN HADDEN**

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## CHAPTER 8

### FUNCTIONALITY AND VENDOR SELECTION

STEPHEN C. HADDEN

#### I. SUMMARY OF TESTIMONY

My testimony addresses the following subjects.

##### A. Perspective on Attributes of the Process and the System

This discussion illustrates how SDG&E has used descriptive phrases to assert things that are true from their viewpoint, but are not absolutely true. It supports the points in following sections.

##### B. SDG&E Process May Incur Cost and Risk Without Benefit

In these paragraphs, I conclude that SDG&E set its technical requirements higher than needed to achieve the AMI benefit it predicts, and that this over-specification incurs costs and risks that the benefits do not appear to justify. I recommend that SDG&E be required either to show a benefit of (or other reason to assert) the most demanding requirements it established, or to re-solicit vendors with a modified Request for Proposals (RFP), relaxing those demanding requirements.

##### C. Acceptance Testing Is Essential and Must Be Adequately Specified in the RFP

In this section of testimony I point out that SDG&E's acceptance testing plans are inadequate. As a result, vendor quotes may not reflect the full costs to test the system. I recommend that, in its subsequent interactions with suppliers, SDG&E be required to specify and include in the project a full and formal acceptance test process.

1           **D. AMI Technology Performance Risk Must Be Managed**  
2           **Appropriately**

3           I point out that the [REDACTED] AMI systems now in contention at SDG&E are [REDACTED]  
4           [REDACTED] networks, and [REDACTED]

5           [REDACTED]  
6           [REDACTED]

7           [REDACTED] I recommend that, in its subsequent interactions with  
8           suppliers, SDG&E should be required to state a requirement and to prepare and  
9           execute a plan to test the network's conformance to the requirement.

10           **E. Residential Meter Life and Warranty Provisions Are**  
11           **Deficient**

12           In this section I describe inadequacies in the warranty and meter life provisions  
13           of SDG&E's RFP that expose SDG&E and its ratepayers to substantial financial risks.  
14           I point out that any vendor-borne costs of mitigating these risks are not now included  
15           in vendor proposals because of the RFP deficiencies. I recommend that SDG&E  
16           include adequate warranty and meter life provisions in any re-solicitation or cost  
17           negotiation/discussion with vendors.

18           **II. PERSPECTIVE ON ATTRIBUTES OF THE PROCESS AND THE**  
19           **SYSTEM**

20           SDG&E portrays its procurement process with descriptors cited in the table  
21           below. None is incorrect, but they may mislead some process participants into  
22           thinking SDG&E's plan will achieve more than realistically can be achieved. This  
23           section of my testimony provides perspective on these descriptors. The intent is to  
24           help all parties and the Commission more clearly understand what the State of  
25           California (or anyone, for that matter) can—and cannot—achieve.

Descriptor	Citation to SDG&E Testimony
buy-as-opposed-to-build ... to ensure ... benefit realization	Chapter 8, page TMR-5, lines 16 and 17
function & benefits driven	Chapter 8, page TMR-6, line 16
most cost-effective, least risky	Chapter 8, page TMR-6, line 20
diminishes technology and functional risks	Chapter 8, page TMR-6, line s 21 and 22
lowest total cost of ownership	Chapter 8, page TMR-6, line 29

All these attributes of the procurement process are good. It is easy to agree with their intent, and hard to disagree. Of course it is good to have an open RFP process, and to seek the lowest total cost of ownership, etc. But to what degree does the proposal do these things? Let's consider them one at a time.

#### **A. "Buy-as-Opposed-to-Build"**

This is the right approach for utilities seeking competent, durable, and sustainable critical infrastructure. It maximizes the likelihood that the equipment needed will be available and supportable for the duration of its useful life. Numerous utilities have developed special-purpose systems for their own uses, and this has worked well in cases where the system was not mission-critical or was constructed to meet the requirements of multiple utilities. But conspicuous business failures have highlighted the risks of the build-your-own approach. Examples include the Motorola PowerCom prepayment service system<sup>1</sup> (despite the many positive aspects of the PowerCom system and of prepayment service) and the Metricom metering and communication system<sup>2</sup> (the communication technology of which is now, more than a decade later, embodied in the latest Cellnet offering). Experience has demonstrated that a single utility driving development of a new system is at great risk for making the system unique to its needs, fostering subsequent business failure when it becomes

<sup>1</sup> "LG&E later received notice that Motorola was terminating its meter production operations.", *Commonwealth of Kentucky, Before the Public Service Commission, An Examination of Louisville Gas and Electric Company's Prepaid Gas and Electric Service*, Case No. 2002-00232, page 5.

<sup>2</sup> "Metricom Files for Bankruptcy Protection", by Ben Charny, Staff Writer, CNET News.com, July 2, 2001, 4:40 PM PDT.

1 clear that the system doesn't adequately serve the broader utility market. When the  
2 supplier of a critical system goes out of business, utilities using that system must  
3 either find a new supplier to support the system or replace the system. Both can be  
4 costly to the utility in dollars and senior management time.

5 SDG&E has made a productive choice on this point, and it should help to  
6 avoid the pitfalls illustrated by previous build-your-own failures. But it is far from  
7 sufficient to ensure success, as SDG&E asserts<sup>3</sup> in its testimony.

### 8 **B. "Function & Benefits Driven"**

9 This is a principal tenet of quality technical decision making: First define the  
10 requirements, and then examine the abilities of alternative solutions to meet those  
11 requirements.

12 The central point is that the requirements must be established based on the  
13 functions required to produce value to the end users<sup>4</sup>. To its credit, SDG&E has  
14 conducted this process with rigorous attention to detail. This is in contrast to an  
15 unfortunate and common tendency in the industry at large (indeed, in our culture at  
16 large) to identify an appealing technical solution, and then construct a business  
17 justification around it.

18 In one particular and important regard I am concerned that SDG&E may have  
19 erred. The technical requirements for SDG&E's AMI included quite demanding  
20 performance requirements, at least two of which are not associated with any benefit  
21 identified by SDG&E:

- 22 • Unusually high degree of completeness in recovering residential meter data  
23 every day (99% instead of the typical 95% to 98%).

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<sup>3</sup> "buy-as-opposed-to-build philosophy to ensure efficiency, cost containment, schedule compliance, and benefit realization from vendors' experience on other projects." *Chapter 8, Summary of AMI Implementation and Operations, July 14, 2006 Amendment, Prepared Updated, Consolidating, Superseding and Replacement Testimony of Ted Reguly*, page TMR-5, lines 15 to 17.

<sup>4</sup> This may be business value, or social value, or environmental value, etc., depending on context.

- 1           • Two independent sets of meter readings (channels) from residential meters,  
2           instead of the common single channel.

3           These two performance requirements certainly increase the program risk for  
4           SDG&E and, in my opinion, probably raise the costs for both the AMI technology and  
5           for risk management.

6           On lines 3 through 19 on page PC-3 of Chapter 9, *AMI Project Management*  
7           *and System Selection Process, July 14, 2006 Amendment, Prepared Supplemental,*  
8           *Consolidating, Superseding and Replacement Testimony of Patrick Charles, Mr.*

9           Charles explains how SDG&E developed its technical requirements:

10           “Therefore, initial activities in SDG&E’s Strategy focused on  
11           identification and quantification of AMI related benefits. ...  
12           subject matter expert (SME) interviews were conducted ...  
13           Based upon the potential benefits identified during these  
14           sessions, SDG&E documented the necessary business  
15           requirements to achieve these benefits. ... The output ... was a  
16           list of the functional, system, information, and technical  
17           requirements. These requirements were then included in vendor  
18           solicitation documents or RFPs.”

19  
20           This is an excellent approach. The testimony implies, but does not explicitly  
21           say, that the two demanding performance requirements mentioned above emerged  
22           from the interview process. But I found no benefit in SDG&E’s business case that  
23           relies on either or both of the two demanding requirements mentioned above. If  
24           SDG&E identified such a benefit during its SME interviews, it failed to include that  
25           information in the business case. If such a benefit were identified and included, it is  
26           possible that it would both improve the cost/benefit balance of the business case and  
27           justify the risks associated with acquiring emerging technology. But SDG&E has  
28           not provided that information and without such justification, it is hard to see how it is  
29           productive to exclude so many capable current-technology systems by imposing  
30           performance requirements that produce no benefit.



1           **C. “Most Cost-Effective, Least Risky – Diminishes**  
2           **Technology and Functional Risks”**

3           SDG&E says its proposal minimizes cost and risk, but the data provided by  
4           SDG&E do not support this assertion. To clarify, let us consider two time intervals:

- 5           1. The duration of the AMI acquisition and deployment, which I  
6           understand to be the proposed AMI program and the subject of this  
7           proceeding. Benefits identified in SDG&E’s proposal arise from  
8           actions taken during this program.
- 9           2. The lifetime of the AMI system after deployment is complete. This  
10          interval extends many years after deployment, during which time  
11          events may (or may not) occur that will require AMI capabilities that  
12          presently provide no benefit.

13          SDG&E appears to have attempted to minimize cost and risk in the second  
14          interval by incurring more cost and risk in the first, but has provided no basis for  
15          believing that the steps taken in the first will, in fact, have any impact on cost or risk  
16          in the second.

17          SDG&E has chosen to acquire “next generation” AMI that meets more  
18          demanding specifications than currently prevail in the industry. But SDG&E has not  
19          identified any economic benefit associated with these features of “next generation”  
20          AMI. All the benefits identified by SDG&E in its Application 05-03-015 are  
21          supported by some available current generation AMI systems. SDG&E technical and  
22          program risks would be appreciably reduced—and identified benefits would not be  
23          appreciably reduced—if it chooses current generation AMI.

24          It is not clear that SDG&E’s AMI approach is most cost-effective and least  
25          risky, or that it diminishes technology and functional risk. It depends on what we  
26          assume about the future risks in interval 2 above. SDG&E has not constructed  
27          scenarios of such future risks to estimate or quantify the benefits of its next generation  
28          choices. When configured consistent with currently prevailing practice, existing,

1 proven AMI systems are probably less expensive<sup>5</sup> and almost certainly less risky in  
2 interval 1.

### 3 **D. “Lowest Total Cost of Ownership”**

4 I agree that SDG&E should pursue the lowest total cost of ownership. SDG&E  
5 carefully evaluated all AMI systems proposed in response to its solicitation and chose  
6 those with the lowest total cost. The objective and the process are commendable.

7 The AMI systems SDG&E evaluated all sought to meet specifications which,  
8 as described above, are more demanding than current prevailing practice. SDG&E  
9 selected the AMI systems with the lowest total cost of ownership *that meet those*  
10 *specifications*. But the demanding performance requirements eliminated current  
11 generation systems from contention. SDG&E might achieve a lower total cost of  
12 ownership by relaxing the most demanding performance requirements to conform to  
13 current practice, then evaluating current generation AMI systems that meet them. If  
14 this is done, I believe the costs will be lower and identified benefits will be  
15 unchanged.

## 16 **III. SDG&E PROCESS MAY INCUR COST AND RISK WITHOUT** 17 **BENEFIT**

### 18 **A. Summary**

19 SDG&E’s AMI procurement process was intentionally constructed to acquire a  
20 “next generation” AMI system. By this process, SDG&E selected [REDACTED] contenders that,  
21 I believe, can be correctly described as “next generation.” [REDACTED]

22 [REDACTED]  
23 [REDACTED]  
24 [REDACTED] The companies offering  
25 these systems appear to have adequate financial resources and excellent technical  
26 people. These newer systems appear to be more readily able to meet the most

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<sup>5</sup> SDG&E’s procurement process didn’t test this, as explained later in my testimony.

1 demanding requirements defined by SDG&E than some other, more mature AMI  
2 systems that have been on the market longer and are more widely deployed.

3 The new systems may be more capable than needed. SDG&E has not shown  
4 that the ability to meet its most demanding requirements contributes to its projected  
5 AMI benefits. It appears that existing, more mature systems are able to meet  
6 requirements that will support the projected benefits.

7 SDG&E's process established that the next generation systems are less  
8 expensive than current systems *if meeting the most demanding requirements is*  
9 *essential*. But the process did not establish the most economical and lowest risk  
10 approach to meeting only the requirements needed to support its projected benefits. It  
11 appears that the supplier and product maturity risks — and associated costs — that  
12 SDG&E will incur to acquire next generation AMI may provide no corresponding  
13 benefit.

14 Accordingly, I recommend that the Commission require SDG&E to either:

- 15 • Demonstrate that the most demanding AMI requirements will provide a  
16 corresponding benefit, or are essential to meet some non-quantifiable policy  
17 goal,
- 18 • OR
- 19 • Re-state its AMI requirements to support the projected benefits, and  
20 examine the AMI alternatives and costs to determine the most cost-  
21 effective and least risky approach to meeting those requirements. This will  
22 likely require re-issuing the AMI RFP with suitable modifications.
- 23 •
- 24 • This recommendation is explained further below.

1       **B. Two Key Technical Requirements Should Be Re-**  
2       **Examined**

3       Among others, two requirements in the SDG&E procurement specifications  
4       were central in limiting the procurement to “next generation” systems. They are that  
5       SDG&E required that residential meters provide:

- 6       • 99%<sup>6</sup> of data by 8 a.m. the next day. See, for example, paragraph 7.1.1.2 on  
7       page 5 of RFP Appendix D *Functional and Technical Requirements*:

- 8       [REDACTED]  
9       [REDACTED]  
10      • Two independent channels of hourly meter data. See, for example,  
11      paragraph 7.6.1 on page 14 of RFP Appendix J *Technical and Engineering*  
12      *Meter Specifications (E&G) Electric Residential Meter Specification*:  
13      [REDACTED]  
14      [REDACTED] and paragraph 7.1.1.4 on page 5 of RFP Appendix D *Functional*  
15      *and Technical Requirements*: [REDACTED]  
16      [REDACTED]

17      These are demanding requirements compared to current industry practice.  
18      More typical requirements supported by existing mainstream AMI systems—for the  
19      moment, let us call them “current generation” systems—are 95% to 98% of data  
20      delivered every day<sup>8</sup>, and one channel of interval (e.g. hourly) data. Some “current  
21      generation” systems can meet the more demanding SDG&E requirement, but only at  
22      added cost for more intensive communication infrastructure or for more capable  
23      meters.

24      Establishing these two demanding requirements had the direct consequence  
25      that most “current generation” AMI systems were rendered non-competitive, and  
26      SDG&E therefore chose the newest AMI generation. Both the cost and risk of next

6 [REDACTED]

7 Paragraph 7.1 says, [REDACTED]  
[REDACTED]

8 In addition to specifying data provided each day, it is normal practice to specify that a system must provide 99% or more of meter data in any 3-day interval, supporting traditional utility billing requirements. SDG&E specified [REDACTED]

1 generation AMI could be worthwhile for SDG&E and its ratepayers if its extra  
2 capability produces additional benefits. But SDG&E has neither asserted nor shown  
3 that these two requirements will provide additional benefits.

### 4 **C. These Two Technical Requirements May Have Increased** 5 **Costs Unnecessarily**

6 Proposals received by SDG&E demonstrate that the “next generation” AMI  
7 systems are less expensive than current generation systems *when configured to meet*  
8 *the demanding 99% and 2-channel requirements* cited above. The well-established  
9 systems of the current generation either can’t meet these requirements at all, or they  
10 incur a higher cost to meet them.

11 If the requirements are relaxed to, for example, 97% of data daily and one  
12 channel of interval data, AMI systems by several other prominent suppliers will be  
13 capable of meeting these requirements, and may be cost-competitive. I say “may”  
14 because SDG&E has not obtained quantitative commitments from suppliers to either  
15 confirm or refute this, and its application is therefore lacking that information. The  
16 proposals submitted to SDG&E by these suppliers included equipment—and  
17 corresponding costs—to meet the more demanding requirements. But, with relaxed  
18 requirements, they may cost less than next generation AMI systems, because current  
19 systems have been in volume production longer than the “next generation” systems,  
20 and because they are somewhat less capable.

21 We must note that the opposite also is possible: The next generation systems  
22 may be cost-competitive with current generation systems *when configured to meet*  
23 *less demanding requirements*. Only a comparison of commitments from suppliers will  
24 establish this. SDG&E, did not, as part of its procurement process, solicit or gather  
25 data to support such a comparison. In either case, the law of diminishing returns<sup>2</sup>

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<sup>2</sup> The New Dictionary of Cultural Literacy, Third Edition 2002 defines the law of diminishing returns defined as follows: “Adding units of any one input (labor, capital, etc.) to fixed amounts of the others will yield successively smaller increments of output.” (See <http://www.bartleby.com/59/18/diminishingr.html>.) Applied to the case in point, the input is money and the output is the guaranteed percentage of meter data gathered every  
(continued on next page)

1 suggests strongly that the AMI system cost will be lower if the most demanding  
2 requirements are relaxed.

3 SDG&E has stated (see discussion and citations in the following paragraphs)  
4 that relaxing its technical requirements to correspond to the benefits it projects will  
5 not lower costs. Although this is possible in principle, it is very unlikely in my  
6 opinion, and SDG&E has provided no substantiation of its assertion.

7 DRA questioned SDG&E in Data Request 38 (DR-38) on the benefits and  
8 costs of the demanding technical requirements. In its response, SDG&E repeatedly  
9 asserted that the demanding technical requirements incur no incremental cost over  
10 more traditional requirements, but provided no support for the assertions.

11 As examples:

- 12 • In response to Question 1 of DR-38, SDG&E wrote, “[A] single channel  
13 solid state residential AMI meter is not necessarily less expensive than a  
14 two channel solid state residential AMI meter. SDG&E believes that the  
15 AMI meters we are planning to field test (and in our business case) are  
16 among some of the least expensive solid state residential AMI meters on  
17 the market.”
- 18 • In response to Question 2 of DR-38, SDG&E wrote, “SDG&E believes that  
19 we are NOT paying a premium for these meters so any and all benefits to  
20 the customer or company are cost effective.”
- 21 • In response to Question 3 of DR-38, SDG&E wrote, “SDG&E is not paying  
22 any unique additional costs to get this functionality ... .”

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(continued from previous page)

day. We are saying that:

- a. If we can buy an AMI system at a certain price that gathers 95% of meter data daily, and
- b. if a 1% increase to 96% costs, say, an additional \$10 per meter, then
- c. the cost to increase it 2% (to 97%) will be more than \$20 per meter (Suppose it is \$25), and
- d. the cost to increase it 4% (to 99%) will be more than \$50 per meter.

Current systems typically retrieve 95% to 98% because that is the optimal balance of cost and benefit in current operations. The law of diminishing returns teaches that retrieving more data will cost disproportionately more money. The cost is high and, in this case, the benefit is small. A similar accommodation must be made for unreported data, whether the amount of missing data is 0.5% or 2%. For low volumes of missing data, the cost of having and exercising this accommodation is not heavily dependent on the volume of the missing data, except for the cost of handling calls from customers who have received estimated bills.

- 1           • In response to Question 4 of DR-38, SDG&E wrote, “SDG&E believes that  
2           two channels of hourly meter data can be provided in support of State  
3           (EAP) and company (flexible rates) initiatives at no additional cost.”

4           The only way to know if less demanding technical requirements will incur  
5           lower costs and risks is to solicit AMI providers for quotes to revised specifications.  
6           SDG&E has not done this. To illustrate the point, one vendor did not bid to provide  
7           AMI to serve the entire SDG&E territory and was eliminated from contention on that  
8           basis. It would have been difficult and costly, perhaps impossible, for the vendor to  
9           meet the demanding requirements. This vendor is active and successful in the  
10          marketplace, but recognized that it did not have a good chance of winning. It was  
11          reasonable for the vendor to decide not to incur the substantial cost of a full proposal  
12          to serve all SDG&E customers. If the requirements had been within reach of the  
13          vendor’s system, it might have decided to bid to serve all SDG&E customers, and its  
14          bid might have been lower cost than the “next generation” AMI systems SDG&E is  
15          now considering.

16           **D. SDG&E Assigns No Value to Meeting the Two**  
17           **Demanding Requirements**

18           1. 99% of Data Every Day

19          SDG&E has said that its “customers presently experience approximately  
20          99.5% of bills with actual, non-estimated billing data” based on manual meter  
21          reading. SDG&E further states that AMI not meeting this requirement will increase  
22          estimated bills (and associated costs) and degrade customer service<sup>10</sup>. This  
23          explanation appears to reflect a misunderstanding of specifications. A system that  
24          meets a 99.5% specification will be no worse than 99.5% on its *worst* day. Its  
25          performance will generally be better, sometimes much better. A manual (or any)  
26          meter reading process that provides “approximately 99.5% of bills with actual, non-  
27          estimated billing data” may, on its worst day, provide only 97% or 98% of meter data.

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<sup>10</sup> See SDG&E response to DRA Data Request 38, Questions 1 and 2.

1 In my opinion, SDG&E could maintain performance equal to the present manual  
2 meter reading performance by specifying AMI that is within the performance range of  
3 current generation AMI technology. Further in my opinion, this is likely to reduce  
4 AMI system cost. SDG&E's application does not support the assertion that requiring  
5 99% of meter data every day provides a benefit that would not also be provided by a  
6 system with lower performance.

## 7 2. Two Channels in Residential Meters

8 The *Joint Assigned Commissioner and ALJ's Ruling Providing Guidance for*  
9 *the Advanced Metering Infrastructure Business Case Analysis* of February 19, 2004  
10 broadly described the AMI capabilities to be evaluated by California's investor owned  
11 utilities. These "functionality criteria" included:

12 *Collection of usage data at a level of detail (interval data) that supports customer*  
13 *understanding of hourly usage patterns and how those usage patterns relate to*  
14 *energy costs.*

15 The "interval data" mentioned is a single channel of hourly data, that is, one  
16 number recorded every hour. That one number is the total consumption displayed by  
17 the meter. (In 24 hours a single hourly channel would record 24 such numbers, each a  
18 little larger than the one before it.) SDG&E interprets this and other text in that ruling  
19 as follows<sup>11</sup>:

20 *SDG&E interprets that this guidance requires hourly data as the minimum level*  
21 *of interval data needed to support the various rates, programs and customer*  
22 *service function benefits that SDG&E has described in its testimony.*

23 SDG&E's proposed demand response program, named PTR, requires a single  
24 channel of hourly data from every meter. Such data can be recorded and provided by a  
25 1-channel residential meter, and the benefit of the demand response program depends  
26 on having that capability. This is consistent with SDG&E's statement in the above  
27 quote, which does not mention a second channel.

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<sup>11</sup> See SDG&E response to DRA Data Request 21, Question 5.



1 I did not find in SDG&E's AMI business case any benefits arising from a  
2 second channel of hourly data. Nor did SDG&E postulate any circumstances or  
3 scenarios in which a second channel of data will produce value.

4 On lines 5, 6 and 7 of page TR-10 of chapter 8, *Summary of AMI*  
5 *Implementation and Operations*, Ted Reguly wrote that:

6 *Mr. Pruschki describes SDG&E's AMI communications enabled electric meters*  
7 *capable of recording and storing consumption that will support programs like net*  
8 *metering and California's Solar Initiative.*

9 Net metering is a way of recording billing data when energy is delivered to the  
10 customer by the utility *and* energy is produced by customer-owned generation at the  
11 customer's location. This can be accomplished with a two channel meter, one channel  
12 to record the utility-generated energy and a second channel to record the customer-  
13 generated energy. It can also be accomplished with a single channel meter, depending  
14 on the applicable tariff.

15 Beginning on line 30 of page PP-6 of Chapter 11 *Communication System,*  
16 *Electric Meters and Programmable Controllable Thermostats, July 14, 2006*  
17 *Amendment, Prepared Supplemental, Consolidating, Superseding and Replacement*  
18 *Testimony of Paul Pruschki*, Mr. Pruschki testified that:

19 *Specific data that is required on a daily basis are hourly intervals for residential,*  
20 *15 minute intervals for C&I, bi-directional and net metering, and revenue*  
21 *integrity monitoring.*

22 SDG&E's benefit calculation includes its demand response program, which  
23 depends on the hourly interval data. But no benefit is identified as arising from the bi-  
24 directional and net metering capability supported by the second channel.

25 DRA asked SDG&E to identify the benefits of the second channel in Data  
26 Request 38, Question 1. In its response, SDG&E said,

27 *[T]wo channel residential meters will help SDG&E support the State's energy*  
28 *policy goals as articulated in the Energy Action Plan (EAP). Renewable energy*  
29 *sources are a significant element of that plan and SDG&E will have two channel*  
30 *meters to help support the measurement of distributed generation. Next, SDG&E*  
31 *requires two channels to help support implementation of new rates for our*  
32 *customers. In order to accurately account for energy delivered and energy*  
33 *received, and the possibility that this energy may have time-differentiated rates*

1           *assigned to it in the future, SDG&E requires that the meter measure both*  
2           *quantities independently.*

3           It is true that two meter data channels are required for *a single meter* to support  
4           distributed generation and rates requiring time-differentiated recording of energy  
5           delivered and received. But requiring two channels *in every residential meter* will be  
6           more expensive than equipping only those meters that serve sites needing this  
7           function, unless a large fraction of all meters require this function. SDG&E has  
8           provided no evidence—or even a prediction—showing that this is either possible or  
9           likely.

10          I acknowledge that no flawless crystal ball exists to predict with certainty the  
11          growth and market penetration of solar or other distributed generation in the next 17  
12          years. But as SDG&E has provided no projection and no credible market research  
13          whatsoever of such penetration, its application provides no basis for asserting its  
14          unusual, and possibly costly, technical requirement for two channels of hourly data in  
15          every residential meter.

16          Accordingly, I question the need for the second channel at every residential  
17          meter in the territory when simpler and less expensive, single channel metering  
18          suffices for other utilities. If two channels are not needed, or produce no economic  
19          benefit, the requirement for a second channel of hourly data from residential meters  
20          should be dropped.

## 21          **E. Conclusion**

22          Two requirements in the SDG&E procurement specifications substantially  
23          limited the field of viable contenders. These specifications were more demanding than  
24          needed to serve the stated meter reading and demand response purposes, and to  
25          provide the benefits cited by SDG&E.

26          SDG&E provided no scenarios or corresponding benefit estimates supporting  
27          the need for or value of two independent meter data tracks (rather than one) and 99%  
28          of data (rather than, say, 97% or 98%). It is entirely possible that direct costs for AMI  
29          Technology could have been reduced by 15% by relaxing these two requirements,

1 while having no effect on the ability of the AMI to support the functions required to  
2 provide the projected benefits. Likely concurrent effects of relaxing these two  
3 requirements include reductions in risk of vendor inexperience and product  
4 immaturity, testing requirements, and attendant costs.

5 Accordingly (restating the two recommendations stated in the Summary at the  
6 beginning of this section), the Commission should require SDG&E to either:

- 7 • Clearly demonstrate that the two demanding requirements are essential to  
8 the ability of the AMI system to support the projected benefits (perhaps by  
9 expanding the projected benefits, with suitable supporting rationale and  
10 data), or are essential to SDG&E and its ratepayers for other reasons.
- 11 • OR
- 12 • Conduct, in parallel with the current Pilot Tests, a partial re-solicitation and  
13 proposal re-evaluation by issuing an amended RFP in which the principal  
14 amendments—aside from clarifications and correction of errors—are the  
15 relaxation of the demanding technical requirements discussed above, the  
16 assertion of a formal Acceptance Test requirement, and adequate warranty  
17 provisions (last two items discussed separately, below).

#### 18 **IV. ACCEPTANCE TESTING IS ESSENTIAL AND MUST BE** 19 **ADEQUATELY SPECIFIED IN THE RFP**

20 Acceptance testing is a critical quality control step in deployment of any large  
21 system. An adequate acceptance demonstrates that the system meets its requirements.  
22 Failure to conduct acceptance tests can and often does produce the following result:  
23 The work is apparently completed; vendors are paid in full; and months or years later  
24 the system develops crucial failures or performance inadequacies that render it  
25 substantially less valuable than originally expected.

26 A prominent, recent example is the famous “Big Dig” highway tunnel under  
27 Boston<sup>12</sup>, nominally completed in the first quarter of 2006<sup>13</sup>. Failure of the bolts (or

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<sup>12</sup> “Fatality adds to long list of Big Dig's woes. Tons of concrete from a section of a tunnel fell on a car Monday in Boston”, by Matt Bradley, *The Christian Science Monitor*, July 12, 2006; “Big Dig collapse predicted; On-site safety officer warned contractor in 1999 that bolts might fail”, by Sean P. Murphy, *The Chicago Tribune*, July 27, 2006..

<sup>13</sup> “Finishing the Big Dig”, by Fred Salvucci, *The Boston Globe*, January 25, 2006.

1 their anchoring) suspending the ceiling of the tunnel resulted in the tragic death of a  
2 motorist on Monday, 10 July 2006 when massive concrete ceiling panels fell on her  
3 car as it passed underneath. Inspections in the subsequent days revealed that hundreds  
4 of other similar bolts are in the process of similarly failing. News reports say the  
5 method of ceiling suspension was tested in 1998 or 1999, and several bolts failed that  
6 testing. It appears now that there was an absence of contractual stipulations—or of  
7 enforcement—requiring remediation of the test failure<sup>14</sup>. Investigations continue now  
8 into why no remedy was implemented. Meanwhile, it appears that this unprecedented  
9 investment in public infrastructure will be unusable for many weeks while the matter  
10 is resolved. Further, it is clear that any remedy will be expensive.

11 The requirement for formal acceptance testing must be established during the  
12 proposal stage of a project. The acceptance test imposes risks and costs on the vendor.  
13 It is essential that vendors explicitly accept those risks and incorporate associated  
14 costs into their proposals. Failure to include formal acceptance testing in the RFP  
15 leaves the risk and cost with the buyer, in this case, the utility and its ratepayers (or, in  
16 the case of the Big Dig, Massachusetts and its taxpayers).

17 SDG&E mentions testing in several places in its RFP, but does not explicitly  
18 require the AMI Technology supplier(s) to support a formal Field Acceptance Test.  
19 Paragraph 6.4.7.8 starting on page 16 of RFP Appendix D *Functional and Technical*  
20 *Requirements 1. Advanced Metering Infrastructure Technology*, says:

21 [REDACTED]  
22 [REDACTED]  
23 [REDACTED]  
24 [REDACTED]  
25 [REDACTED]  
26 [REDACTED]  
27 [REDACTED]  
28 [REDACTED]

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<sup>14</sup> “No evidence of bolt retests for much of tunnel ceiling; Tougher exams ordered in ‘99”, by Scott Allen and Sean P. Murphy, *The Boston Globe*, July 26, 2006.

1 I found no other, more specific language in the RFP regarding AMI system  
2 tests. There is no mention of the consequences of test failure, alternatives or  
3 conditions for remedying test failure, or the potential consequences of successive  
4 failure of attempted remedies.

5 DRA issued a data request to SDG&E on this subject (Data Request 25). In its  
6 response, SDG&E wrote:

7 SDG&E's [sic] has requested funding for AMI project management staff  
8 who will oversee ... system installation and concurrent "acceptance  
9 testing". Thus, while acceptance testing is not called out as a specific line  
10 item, it is but one aspect of AMI project management and is implicitly  
11 being funded.

12 The specific details for acceptance testing will be determined after selecting  
13 the vendor(s) and will be incorporated in the contract. ... In the vendor  
14 contract SDG&E will specify gates or conditions that will in effect  
15 constitute formal acceptance testing.<sup>15</sup>

16  
17 Notwithstanding SDG&E's suggestion that ample performance assurance is  
18 implicit in its procurement process, and SDG&E's further assurance that payments to  
19 suppliers will be triggered by evidence of satisfactory performance, the project  
20 documentation reveals a conspicuous and disturbing absence of a specified formal  
21 *Field Acceptance Test*. A formal acceptance test is an event that is distinct from other  
22 aspects of the routine deployment process of an AMI system, and is recognized as an  
23 element of best practices in large system deployments, including AMI system  
24 deployments<sup>16</sup>.

25 The test is defined in a carefully developed Acceptance Test Procedure (ATP).  
26 The ATP specifically sets forth the test sample, the specific tests, their scope, duration  
27 or repetitions, the Acceptance Test Report (ATR) with recording formats, data

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<sup>15</sup> SDG&E Response to DRA Data Request 25.

<sup>16</sup> See, e.g., "ESCO Announces TWACS(R) System Acceptance at PPL Electric Utilities", ESCO Technologies Inc. news release, 26-Apr-2005.

1 requirements, documentation requirements, and formats. The ATP must also address  
2 witnessing, explicit pass/fail criteria, and recycle/retest allowances for remediation of  
3 failed test sequences. A failed Acceptance Test, after remediation allowances are  
4 exhausted, will normally have extreme contractual ramifications.

5 The formal Field Acceptance Test reaches beyond demonstrating routine  
6 system operation, and tests performance at the specified extremes of operation under  
7 all foreseeable operating conditions, to the extent such extremes can reasonably be  
8 tested. As examples, this typically involves:

- 9 • Forcing meter data recovery rates to levels that wouldn't be experienced in  
10 normal operation.
- 11 • Showing performance in the presence of interfering noise sources as might  
12 be experienced due to lightning or arcing on distribution system  
13 insulators<sup>17</sup>.

14 All well-established AMR/AMI system suppliers are familiar with formal Field  
15 Acceptance Tests. Since the design, conduct and documentation of these tests, and the  
16 consequences of failure, have very distinct and potentially dire contractual  
17 ramifications, it is customary and is good practice to set forth these requirements in a  
18 AMI Request for Proposals (RFP), and to seek specific vendor acknowledgment that  
19 the costs and consequences of such tests are included in its proposed effort.

20 SDG&E has not clearly and expressly included the requirement for formal  
21 Field Acceptance Tests, and the Commission should require SDG&E to do so, either  
22 in a re-bid of its earlier RFP or separately. SDG&E said the acceptance test  
23 requirement is "implicit." But it is crucially important to place the cost and risk of  
24 acceptance test failure on the vendor. This is not accomplished unless the acceptance  
25 test requirements are explicitly included in the RFP, the vendor proposals, and the  
26 negotiated contract. Failure to do so potentially deprives the utility later of an  
27 enforceable ability to conduct such tests and hold the vendor(s) responsible for any

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<sup>17</sup> Accumulated environmental debris on electric distribution insulators can cause electric arcs to occur (similar to a mini-lightning event) that radiate electrical noise that can interfere with radio devices in the immediate area.

1 test segment failures. SDG&E can say that it will be included in the contract, and that  
2 is good. But the only way to know the full cost import at this stage is to include it in  
3 the RFP (and therefore the proposals). Accordingly, the Commission should require  
4 SDG&E to obtain this information through the RFP process.

5 **V. AMI TECHNOLOGY PERFORMANCE RISK MUST BE**  
6 **MANAGED APPROPRIATELY**

7 SDG&E has chosen two AMI systems that use a relatively new AMI  
8 technology called [REDACTED] It is not apparent that SDG&E has  
9 planned the testing necessary to identify and mitigate a principal risk of such  
10 networks: the risk that the network will not be able to deliver critical messages at a  
11 time of high communications demand.

12 [REDACTED]  
13 [REDACTED]  
14 [REDACTED]  
15 [REDACTED]  
16 [REDACTED]  
17 [REDACTED]  
18 [REDACTED]  
19 [REDACTED]  
20 [REDACTED]  
21 [REDACTED]  
22 [REDACTED]  
23 [REDACTED]  
24 [REDACTED]  
25 [REDACTED]  
26 [REDACTED]  
[REDACTED]

1 [REDACTED]

2 [REDACTED]

3 [REDACTED]

4 [REDACTED]

5 [REDACTED]

6 [REDACTED]

7 [REDACTED]

8 [REDACTED]

9 In paragraph 6.3.1.3.1.2 *Key Requirements* on page 9 of Appendix D  
10 *Functional and Technical Requirements 4. System Integration*, SDG&E requires of  
11 the system: [REDACTED]

12 [REDACTED]

13 [REDACTED]

14 [REDACTED]

15 [REDACTED]

16 SDG&E is conducting “pilot tests” of the [REDACTED] chosen technologies. This is  
17 good and I applaud the intent, though the application and supporting testimony  
18 provide very little detail of the content of those tests. SDG&E has said<sup>19</sup> that the pilot  
19 tests involve about [REDACTED] meters [REDACTED]. While many useful and productive tests can be  
20 conducted in this setting, [REDACTED] meters is far too few to seriously challenge [REDACTED]  
21 [REDACTED] capacity of the chosen systems.

22 The inability of the pilot test to assess the [REDACTED] capacity highlights  
23 the importance of a suitable Field Acceptance Test approach. The specification should  
24 declare the required [REDACTED], and the Acceptance Test  
25 should test it.

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<sup>19</sup> “Pilots will be limited to [REDACTED] meters or less”, SDG&E AMI RFP Appendix D *Functional and Technical Requirements, 1. Advanced Metering Infrastructure (AMI) Technology*, Section 9.1, page 32.



[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED] SDG&E should be required to assert a rigorous Acceptance Test approach and to require vendors to include it in their proposals. Failure to do so may result in a deployment that cannot perform as intended and will not serve its purposes at the high-demand times when such service is most urgently needed. The approach should include rigorous testing relatively early in the deployment cycle, and again later when enough meters are in place to support a meaningful message capacity test.

## **VI. RESIDENTIAL METER LIFE AND WARRANTY PROVISIONS ARE DEFICIENT**

Meter life and vendor warranty provisions included in SDG&E's procurement documents are grossly inconsistent and expose SDG&E and its ratepayers to significant financial risk.

Section 3, *Performance*, on page 6 of RFP Appendix J, *Technical and Engineering Meter Specifications (E&G) Electric Residential Meter Specification* asserts that residential meters, [REDACTED]

[REDACTED] It further requires that, [REDACTED]  
[REDACTED]

Section 4, *Warranties*, starting on page 6 of RFP Appendix J, *Technical and Engineering Meter Specifications (E&G) Electric Residential Meter Specification*, requires bidders to warrant that meters [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

SDG&E's RFP omits major provisions that should be present to:

1 [REDACTED]  
2 [REDACTED]  
3 [REDACTED]  
4 [REDACTED]  
5 [REDACTED]  
6 [REDACTED]  
7 [REDACTED]  
8 These are substantial risks. The cost of field labor to replace a failed meter can  
9 approach the value of the meter. [REDACTED]  
10 [REDACTED]  
11 [REDACTED]

12 This is not a  
13 theoretical possibility. Latent defects in electronic products, while not common, are  
14 not rare. I am not suggesting that the vendor must bear all the risk. Rather, I suggest  
15 that a rational sharing of risk is appropriate and necessary to protect SDG&E and its  
16 ratepayers. This indispensable requirement may add program cost that is not now  
17 apparent because it was not included in the RFP.

18 I recommend that SDG&E be required to correct these deficiencies by  
19 establishing adequate warranty terms (and ascertaining the associated costs), either  
through a re-bid of its earlier RFP or through separate discussions with vendors.

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<sup>20</sup> A defect that could not have been discovered by a reasonably thorough inspection at the time of delivery to the utility, contrasted with an apparent defect, which can be discovered.

<sup>21</sup> Unless California law imposes a statutory obligation for latent defects on the vendor until the expiration of an applicable statute of limitations.